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ABSTRACT

This report discusses two existing devices for social policy formulation, details their current shortcomings, and reports on modifications designed to improve them as tools for policymakers and institutional planners. The two tools are Delphi -- with its modification, Focus Delphi -- and Cross-Impact Matrix -- with its modification, the Cross-Purpose Matrix. The Focus Delphi is a tool to help planners identify existing consensus and dissensus among various groups in society. The process systematically collects perceptions of interested publics and keeps separated their responses about the goals and needs under examination. The Cross-Purpose Matrix brings the proposed strategies of the several goal advocates into the open to aid priority assessment. This process arrays the competing goals in a matrix and forces an examination of the relative value of each with reference to all others. Related documents are EA 004 240 and EA 004 241. (RA)

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EDUCATIONAL POLICY FORMULATION: PLANNING WITH THE FOCUS DELPHI AND THE CROSS-PURPOSE MATRIX

by

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TABLE OF CONTENTS

	Page
INTRODUCTION	i
PART I - THE FOCUS DELPHI: A TOOL TO QUERY INTEREST GROUPS	1
The Delphi Technique	3
Claims	3
Process	5
The Delphi Assumptions: An Examination	7
Focus for Modification	9
The Focus Delphi	12
An Experiment With the Focus Delphi	14
Focus Delphi: Design Factors	16
Focus Delphi: Round II	18
Focus Delphi: Round III	19
Focus Delphi: Round IV	20
Computer Analysis of Focus Delphi	22
Background of Analysis	22
Statistical Considerations	23
Some Findings from Round III	24
Designer Comments on the Focus Delphi as a Planning Aid	28
The Assessment of Goals and Strategies Against Future Events	28
INTERLUDE	31
PART II - THE CROSS-IMPACT/CROSS-PURPOSE MATRIX: A TOOL TO HELP SET INSTITUTIONAL PRIORITIES	33
The Cross-Impact Matrix	35
The Cross-Purpose Matrix	36
Analysis	40
Author's Note	43

BIBLIOGRAPHY 44

APPENDICES

Appendix A--Focus Delphi--Round I Materials 47

Appendix B--Focus Delphi--Round II Materials 51

Appendix C--Focus Delphi--Round III Materials 57

Appendix D--Focus Delphi--Round IV Materials 63

Appendix E--Focus Delphi--Figure I, Figure II 69

EDUCATIONAL POLICY FORMULATION: PLANNING WITH THE FOCUS DELPHI AND THE CROSS-PURPOSE MATRIX

INTRODUCTION

Our concern is to clarify and to place in perspective two existing devices for social policy formulation. There is a need for planning tools that allow multiple publics to contribute to the policy formulation process. Most tools for policy planning and forecasting do not address themselves to this charge. Two, in particular, cause us great concern: the Delphi and the Cross-Impact Matrix. This report details their purported functions, demonstrates the fallacies of their claims and details modifications we have designed and tested to turn these devices into tools for policy-makers and institutional planners. We call these modifications the FOCUS DELPHI and the CROSS-PURPOSE MATRIX.

The Focus Delphi is a tool to help planners systematically identify existing consensus and dissensus among various groups in society. The process systematically collects the perceptions of an array of interested publics and keeps separate by defined group their responses about the goals and needs under examination. It delivers, among other things, estimates about value to self and/or society, consequences foreseen, perceptions of power to cause the event, and strategies possible to enhance or retard the occurrence of the goal.

Knowledge of the opinions held by various publics is important when trying to define where we are and where we wish to go. The different

perceptions of where we should go (our several goals) may help responsible men to decide priorities more equitably when making policy for the universe of their influence. It is necessary to understand in some detail the proposed strategies of the several goal advocates in assessing institutional priorities. The Cross-Purpose Matrix is designed to bring these strategies into the open in order to aid priority assessment.

This process arrays the competing goals in a matrix and forces, through human deliberation and discussion, an examination of the relative value of each with reference to all others. The resultant display is useful when priorities must be set based on limited dispersible resources.

The devices are dealt with together in this paper because we feel they are related. Both were designed at the Educational Policy Research Center at Syracuse by the author and have been used by several groups over the past two years for similar purposes.

I wish to make two points very clear at the beginning: This is a report of work that spans the last two years. Much of what is reported out here has appeared in bits and pieces in reports of on-going work with these tools. There is no claim made or implied that these devices as outlined will have value to the reader if translated directly. This is a state-of-the-work report. I am making this report available to speed its examination, utilization and modification. I request that all work that emerges from a reading of this report be brought to my attention so that I may be kept informed of its development and in turn share with interested readers my developing work.

A second point is in order. As with all devices that aid the decision-maker in collecting information, these two--more than most others--have great potential for misuse and manipulation. I can only hope that they will be used with integrity.

Stuart A. Sandow

February 1972

PART I

THE FOCUS DELPHI: A TOOL TO QUERY INTEREST GROUPS

THE FOCUS DELPHI: A TOOL TO QUERY INTEREST GROUPS

The Delphi Technique

Claims

The Delphi Technique is a process for eliciting and refining the opinions of a group of individuals. The individuals remain anonymous to each other, their opinions are continually refined and reiterated, and feedback to participants is controlled. The process is believed to produce either converging group consensus or polarization of views (Gordon, September 1969, p. 3; Helmer, September 1969, p. 2).

The Delphi Technique is a variant of the panel or committee approach for arriving at a consensus or majority opinion. Its design eliminates face to face confrontation as experienced on a panel or committee. Presumably, it prevents specious persuasion, individual unwillingness to abandon publicly held positions, and the bandwagon effect of a majority argument. It replaces direct discussion with a series of carefully controlled questionnaires that return edited opinions and new information to the participants, who then act in privacy and respond to the successive inputs. The committee or panel report is replaced by tabulated data from the several respondents, from which the Delphi coordinators make their interpretations and analyses to arrive at a series of forecasts, opinions, and occasionally scenarios, rather than an expository report.

The major proponents of the technique--Norman Dalkey, Theodore Gordon, Olaf Helmer--accept the assumption of the decision-maker as purchaser of expert opinion. They argue that when questions asked are in the long-term future, are complex in nature, and are subtle in their relationships, one expert is inadequate. They assume that many experts are better than one and that experts as a group will exercise careful judgment in their deliberations. A consensus is sought, rather than an array of self-interested responses.

They also speak of the method as a proven technique (Gordon, September 1969, p. 3) which generates consensus when long-term forecasts are involved. Further, it is claimed that the output of a Delphi provides the basis for subsequent planning, action, and analysis (Gordon, September 1969, p. 4).

The purposes of the Delphi as it exists are believed to be:

- the collection of expert opinion;
- the elimination of certain negative aspects of panel responses;
- the generation of consensus opinion about certain events;
- the generation of greater or more reliable information than any one expert could produce.

Delphi can ostensibly be used as:

- a tool for forecasting;
- a basis for long-term planning, action, and analysis;
- a device for eliciting careful judgment,
- a seemingly coherent structure for testing alternative contemplated actions.

The device has been used as a forecasting process leading directly to plans in the areas of political alliances, technological potential,

war prevention techniques, economic indices, medical developments, and education. (Gordon, September 1969, p. 4)

Process

The basic Delphi process involves a series of questionnaires. The first questionnaire is a list of future events chosen by the coordinators of the Delphi and/or their employers. This questionnaire is distributed to the participant experts chosen by the coordinators and/or their employers. Each participant is asked to indicate both when they think the event will take place and how familiar they are with the item, then to suggest additions to the list of events. The estimate of the time horizon for the event involves a probability estimate as well. That is, for each event the respondents supply a date for 10% probability, 50% probability, and 90% probability, thus estimating the earliest possible date, the date most likely, and the date before which the event almost assuredly will have occurred. The Delphi coordinators tabulate the results of the data from this first round of questionnaires and edit the additional events suggested.

The second questionnaire is similar to the first, but displayed with each event is the individual's own response, and the inter-quartile range* of responses generated by the entire group of participants. Each participant is asked to justify why his opinion is outside the inter-quartile range (if it is), and/or to shift his estimate if he so chooses. (In certain variations, the second round asks for important societal and technological changes or consequences that may occur because of the event [Gordon, September 1969, p. 17] without asking the respondent to place

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* Inter-quartile range: That middle 50% of all responses, dropping out the 25% extremes at both ends of the scale.

the event in time.) The coordinators then tabulate a new inter-quartile range and edit the reasons given for opinion shifts.

The reasons for any shifts and the new inter-quartile range are returned to the participants as round three. The participants are asked to examine the reasons given for opinions outside the inter-quartile range and to shift their date if they so choose. (In variants as described above, the process of stating opinions and reasons occurs in this third round along with a value assessment concerning the effect of the event on society.) The coordinators tabulate a new inter-quartile range and it is returned to the participant with his previous estimate.

The fourth and final round asks the participant to address, for each event, any/all of the following questions:

- What are some of the consequences of the event's occurrence?
- What methods of control might be feasible to prolong, prevent, or enhance the event's occurrence?
- What are the social consequences ('very favorable' to 'very detrimental') which may result if the event occurs?

The coordinators analyze this data to construct scenarios of future blocks of time spanning 10-25 years.

Note: This is only a description of the most common Delphis. There is nothing that limits the number of passes or the questions asked.

The terminal display of the Delphi exercise is generally a series of scenarios reflecting the Delphi coordinators' interpretations of the inter-quartile range data, a listing of the events with the final inter-quartile range for each, and other edited information of the participants.

Keeping in mind both the purposes of the Delphi and the assumptions that underlie it, we must ask if it is a good forecasting tool, of any value for planning, or merely a useful set of systematic questions.

The Delphi Assumptions: An Examination

Assumption: The inter-quartile range is an accurate reflector of attitude

In the final tabulations of the opinions generated by the Delphi, the only opinions dealt with are those within the inter-quartile range of responses. The inter-quartile range reflects only the opinion of 50% of a group. It is not a majority opinion. A panel of experts confronted with 50% agreement might deliver a majority opinion based on the chairman's vote and a minority opinion or opinions reflecting the range and reasons for dissent from the majority. Although not specifically excluded in the process, the Delphi coordinators historically do not supply minority reports, even though the consensus reported does not represent agreement as to a date, but rather the span of time within which the middle 50% of the respondents fell; nor can the importance of the lack of a minority statement be dismissed in assessing the Delphi as a forecasting and planning tool.

Assumption: Expertise can be identified

Who is an expert on the future and is a group of experts necessarily better than any one expert? Delphi proponents admit that general expertise about social affairs is next to impossible to locate in any one man, and that expert agreement in general or specific areas is difficult to reach. The input to the Delphi is always drawn from a group of what are constituted as "experts." Expertise is a descriptor attributed to someone, not a quality one can ascribe to himself. A person can claim to be knowledgeable about a field, while others may ascribe the status "expert"

to him, based on their perceptions of his knowledge base. The future is a mental construct each individual develops in his own mind (Wolfson, 1970).

A claim of expertise about events in the long-term future may be predicated on the knowledge of some goal or planned series of events. Without a knowledge of the strategies and goals of the planning group which asks the Delphi question, it would seem difficult for the respondents to supply accurate judgments on, or useful focus about, events posited in limbo.

Assumption: Aggregate opinions reflect valid forecasts

Is the Delphi a forecasting tool? A forecast is an opinion about the future. One-half of the opinions given in a Delphi are considered the aggregate forecast of the group concerning an event's occurrence.

Assumption: Event forecasting is directly relevant to strategy implementation

Is it a planning tool? A plan demands the specification of a goal or the end to be reached by that plan. With Delphi, the plan is not supplied to the experts before their deliberations and the events are not internally linked to any goal or strategy. It would seem difficult to assess a plan based on the opinions of men who were not aware of the plan prior to their deliberations.

Assumption: Queried "experts" forecast rationally

Can the experts be assumed to make rational judgments? No evidence exists for this claim. Nor does consensus of one-half of a group represent careful judgment in arriving at that consensus.

Assumption: Delphic structure explicates coherent patterns

Is the Delphi a seemingly coherent structure for testing alternative contemplated actions? The events are not focused against a plan and they are not linked to the present in any plausible way to allow a planner to assess a strategy in light of them.

Assumption: It is possible to respond with reasoned judgment to the events and the queries about them.

It seems unreasonable to ask respondents to make a value assessment of an event without knowing the entire social fabric surrounding the moment of the event's occurrence, their own place with respect to that future moment, and their personal goals for that moment.

Focus for Modification

In spite of all these weaknesses, we might reasonably ask if the questions asked and the responses generated through a Delphi do supply information that can be useful in long-term planning. The process involved in the Delphi Technique could become a valuable tool for planning if we assign to it different values, and reconsider the population comprising the "expert" input. We know that the process focuses the respondents' attention on an array of possible events in the future. Depending on the variation, it demands that they detail a date, a probability estimate, a desirability quotient, a list of perceived consequences, and an explication of a possible way to control the event's occurrence. These opinions or perceptions about isolated events in the future may have value for the planner if the assessments are made with some reference to a plan, a strategy, or a goal.

Most human events (i.e., social changes, technological advances, etc.) are the result of human actions and reactions. Men believe that the environment is controlled by specific actions. If we think of future events in terms of who might act to make them occur we might think of them as goals. We might say that future events are similar to goals in that they are the 'not yet occurring states of affairs' that to occur must be aggressed for by someone or some group. This idea may have value in clarifying our use of the Delphi to assess our plans.

If we assume that goals are a type of future event, and that for a goal to be realized some strategy must be pursued, then we can argue that a specific goal can be made to occur either by pursuing a specific strategy or by allowing some condition to exist such that, at some point in the future, it will be likely that the event will occur. Obviously, simply allowing a condition to exist is a strategy if we consciously recognize the outcome it might produce.

To know that an event, X, may occur in the future and that the event may occur between now and the moment of occurrence of another event, Y, is not sufficient information to judge the impact of event X on Y. We must know the strategies to Y that will be operational at the moment of X to estimate an impact. We might say that the strategy followed in the pursuit of Y is comprised of a series of other, secondary, events/goals. It is these interim events that can give us the perceptual base to make opinionated judgments about specific events that we examine with a Delphi process.

From the above, four assumptions can be stated which form the basis of a useful redesign of the Delphi process.

1) Plans, goals and strategies for a society affect different subsets of that society in different ways.

2) Those self-interested subsets might be reasonably perceived as the several "experts" about the plan, strategy, or goal.

3) It is against the proposed actions of a society that societal events must be weighed.

4) Men in the aggregate don't make plans and pursue strategies toward goals; rather, individual men representing individual institutions do.

Without seriously altering the process of the technique we might alter the nature of the inputs and the populations from whom we request inputs. The persons in a planning department are certainly expert concerning their personal goals for the institution. Their opinions must be integrated into the feedback system the Delphi supplies. The experts--that is, those persons comprising the respondent population--might be the several populations who are in some way involved in, or affected by, the pursuit of some goal. All persons are experts in their own opinions about the value of some goal. All persons are experts in their own opinions about the value of any goal to themselves. Different persons or interest groups may have radically different opinions. Thus they cannot be seen as an aggregate from which one might extrapolate directly a consensus opinion about events relevant to those goals. To disaggregate the several subgroups, the inter-quartile ranges of the several expert/interest groups could be displayed to allow the planners to assess the differing perceptions of those subgroups.

Further, goals are pursued through strategies. For any event, some group or groups have the power or authority to instigate a strategy which will greatly increase the probability of the goal's occurrence. The opinion of individuals involved in a Delphi exercise may be predicated on their perception of the probable actions that must be taken by men with authority to cause the event's occurrence.

If the last question asked of the several expert/individuals (What controls might be possible for this event?) was replaced with: "What subgroup of those involved could control the occurrence of the event and how?" we might generate information for planners that would help them in their resource allocation. In pursuing a goal, certain affected subgroups may have to be convinced of the merits of the goal. They may hold a misperception about the goal or the strategy to the goal, and will thus affect the goal's attainment. Energies may have to be invested to convince these groups.* A knowledge of the perceptions of the several groups and the opinions about the power base for each event in question might focus the planner's attention and energies in those areas where the most opposition or misunderstanding exists. It may also conserve energies by identifying where they are not needed.

These modifications point to an altered use of the Delphi only hinted at by the designers. That is, Delphi can generate a framework of goals from which institutions and the publics they serve can choose priorities.**

The Focus Delphi

The Focus Delphi is a modification of the Delphi technique. Its specific purpose is to translate a forecasting tool into a device to assist planners.

The first assumption underlying the Focus Delphi is that planning addresses itself to the pursuit of goals. Further, goals cannot be assessed in isolation; rather, they must include a description of the strategies

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* Or, alternatively, to get them to explicate their, possibly more valid, reasons for disagreement.

** For a more thorough and comprehensive analysis of the Delphi Process, see Weaver, W. T., EPRC 1969-1971.

to be pursued to arrive at the goal. The original Delphi process holds society as a constant so that quantitative information can be generated for forecasting. While it may be sufficient to know when an event might occur for forecasting, the social planner cannot afford to treat people as a constant. He must address their concerns. To do this, he must tap their perceptions of the relative value of the goal and note the strategies they might bring to bear to enhance or retard the occurrence of the goal, before commencing action toward either his plan or his goal.

A second assumption underlying the Focus Delphi is that goals are a class of future events. While the Delphi treats future events as independent entities, an advocate can be identified for goals. This advocate is someone who has the responsibility or the desire to see the goal occur. The motives of the goal advocate are interwoven with the goal itself--as are his strategies. A planner needs to know how people from various segments of the affected society might react to the projected goal and its strategy in order to define his plan.

A third assumption of the Focus Delphi is that for any institutional goal, not only the advocates, but also the affected populations can be identified. Each group would certainly have opinions and beliefs about any goal, each for differing and legitimate reasons.

The Focus Delphi deals with these assumptions. It is conducted in the same way as the Delphi, with several anonymous rounds of reiterated data, searching out but not forcing consensus information. The differences from Delphi are substantive; they are differences in questions asked and data dealt with, rather than differences of process.

First, participants are drawn from each population and interest group affected by the goal, not from some "expert" group. Second, each group has its own inter-quartile range displayed on reiteration, rather than a blending of estimates for all groups. Third, the questions in the

third round deal with perceptions of power (i.e., Which of the involved groups has the power to cause the event? and, What strategies might you, as a member of your affected group, bring to bear to enhance or retard the event's occurrence?).

With these modifications, the planner can now elicit, not consensus but sustained divergence, to help him assess his plan. Second, the process is appropriate to meet a yet unsatisfied need--a way to gather resource information for reasoned and informed policy-making.

An Experiment With the Focus Delphi

The first Focus Delphi was conducted for the New York State Education Department Bureau of Two-year College Programs in 1969-70 under the direction of DeLayne R. Hudspeth. What follows describes the structure and content of a Focus Delphi designed to collect and report how persons both in and associated with an education system view events relevant to their future.

The major function of the research was to refine the Delphi process so that those engaged in policy planning could more clearly explore social alternatives by analyzing levels of consensus within a social system. Unlike a traditional Delphi, the purpose was not to elicit, or force, consensus, but rather to discover where--or where not--it already existed. Subsequently, we looked at the input/throughput/output characteristics of an educational system to determine if time estimates and value assessments differed significantly between these sectors. We also included a group whose relationship to the primary group was largely supportive; either through a consulting, funding, or policy-making role.

Although only time can tell if the differences between groups are significant (statistics for futures analysis being still in the future), the results of the study were gratifying to the researchers. Data for

some of the events showed a clear difference of opinion by role. In traditional Delphi studies, these differences are combined into one interquartile range, thus burying potential conflict among various publics. With the Focus Delphi it becomes possible to identify those events where time estimates or value assessments differ between groups within the system.

Knowledge of the differences of opinion held by those with different roles within a system is valuable for the policy-maker; identifying disagreements might lead to one strategy for an event having high probability of occurrence (all sectors having agreed as to when an event might occur and to its potential value) and another strategy for an event where one or more sectors clearly disagree.

Delphi is suited for displaying a wide range of events; frequently the range of events is so broad that the major problem in using the data stems from the discontinuity among events. The problem in designing the Focus Delphi was to structure the data collecting system in such a way that events were internally coherent. It was particularly important that participant views could be analyzed by input category so that differences determined by the function of the group within the parameters of the "affected population" would be clearly visible.

For the purpose of educational planning it is important that both a "producer" and a "consumer" be considered expert. That is, policies should be planned using at least three kinds of data: 1) about the programs the student comes from as he enters the educational system, 2) about the program itself, and 3) about the "consumer," the student and employer or next school system. In short, the input, throughput, and output of an instructional system must be a part of the planning process. Further, any planning effort must take into account present programs, and

the trends they represent, as well as totally new programs (for example, environment monitoring technicians).

Keeping the above views in mind we named this process "Focus Delphi."

Focus Delphi: Design Factors

Traditional Delphi studies select their participants on the basis of subject "expertise." These judgments are made on the basis of prominence in their field, reputation, professional visibility, and, to some extent, their being known to--or more importantly by--the Delphi coordinators. As detailed above, however, we felt that "expertise" was of less value for planners than a range of affected interest-group attitudes. The participants, therefore, were not assumed to be familiar with Delphi nor to possess the conceptual attitudes required in completing a traditional Delphi questionnaire. For this reason, the questionnaires had to be as simple as possible, and the information feedback as limited as was consonant with practicality.

Four groups were defined: high school personnel who sent students to two-year programs assuming something went on there; college faculty and administrators who thought they did something; personnel officers for corporations who hired graduates of these programs thinking that they were buying something; and finally, a loosely defined group of policy advisors, legislators, and consultants, who comprise an influence structure for education policy.

The nature of this experimental Delphi necessitated that the events to be examined were generated by persons other than the Delphi coordinators. Thus, the first round of the Delphi consisted of a questionnaire designed to elicit from each respondent ten (10) events that he considered

as plausible occurrences in the future. The cover letter to the questionnaire defined what was meant by an event, explicated possible categories of such events, and requested participants to list them on a response form (see Appendix A, pp. 47-50).

Because it was assumed that respondents would describe similar events with different terminology, and that these descriptions could alter time perceptions as to when the event might occur, the coordinators did not ask participants to date the events in any way. In fact, respondents were requested to conjecture without reference to time for this phase of the study.

When all first round responses were returned, the Delphi coordinators divided them into the four respondent groups (not defined for respondents until the cover letter for Round III; see Appendix C, pp. 57-62). The events were then collated for similarity, edited, and rewritten. The sheer bulk of the number of suggested events required selection by the coordinators. Events for Rounds II and III were chosen on the basis of four criteria:

a. Repeated occurrence across all four groups;
b. Heavy emphasis within one group;
c. Imaginativeness and/or "interestingness" (purely subjective);
d. High visible impact on electro-mechanical technology and education.

When the hundreds of various suggested events had been narrowed to a workable number (sixty in this study), they were further organized into three categories:

a. Technological innovations;
b. Events impacting primarily on educational institutions;
c. Events impacting primarily on industrial institutions.

These events were then typed on the Round II form and mailed to respondents (see Appendix B, pp. 51-55).

Focus Delphi: Round II

In the second round, respondents assigned dates to the range of conjectures generated in the previous round. They were asked to write in two dates for each event:

a. The earliest possible date for the event's occurrence;
b. The date by which time the event most probably would have already occurred.

The respondents were asked to restrict their dating conjectures to a period covered by the next fifteen years. Additionally, they were given two dating options:

c. "Later" if they felt the event might occur, but at some date beyond 1985;
d. "Never" if they felt the event would never occur.

Respondents were also given a blank time-line space on which to mark the second (most probable) date ("b" above). The coordinators while designing this round had not anticipated making use of a computer to help analyze the data when the forms were returned. Computer analysis was soon seen to be significantly more feasible, however, and subsequent data was analyzed in this fashion.

The respondents' "most probable" conjectures were analyzed by a program specifically designed to print out various aggregates of the information and group inter-quartile ranges for each event. The Round III response form was generated from the print-outs of the four inter-quartile ranges.

Focus Delphi: Round III

The Round III questionnaire (see Appendix C, p. 59) contained three "bits" of information:

a. The events generated by Round I, aggregated and edited by the Delphi coordinators;
b. The respondent's own original "most probable" date estimate from his Round II questionnaire;
c. The four inter-quartile ranges--one per group--for each event, with the median date for the entire group specified.

Respondents were asked for five "bits" of new information:

a. A new date conjecture if they felt their original estimate was inaccurate;
b. An explanation of why, if their date for any event was outside their group's inter-quartile range, they felt this date was more accurate; or, why they changed their date if they chose to do so;
c. What they considered the value of the presumed occurrence of the event would have for them, personally, on five point scale (++, +, 0, -, --);
d. What they considered the value of the presumed occurrence of the event would have for society in general, on the same scale as "c";
e. An explication of what the specific consequences would be for society in general, again presuming the occurrence of the event.

The coordinators felt that a differentiation between personal values and value for society was important to focus the respondent's concern on specific impacts of each event's occurrence. Had there been more time available between rounds, the value of this could have been compounded by asking participants to explicate personal consequences as well as societal ones. While the data may not have been directly useful to the study, the heuristic exercise it would have afforded the participants would have been valuable.

When these questionnaires were received, the new dates were fed into the computer, as were the personal and societal value data. The "consequences for society" statements were collated, refined, and rewritten to purge them of over-pejorative implications.

Focus Delphi: Found IV

The Round IV response form (Appendix D, p. 65) reported back to respondents five pieces of information:

a. Twenty of the original sixty-three events;
b. Adjusted inter-quartile ranges based on Round III dating;
c. Personal value percentages, disaggregated by groups, on a three point scale (+, o, -);
d. Societal value presented in the same way as (c) above;
e. The edited "consequences for society" from Round III.

The twenty events to be included in the fourth round were chosen on the basis of four criteria:

a. The events of the most positive value for society, based on the Round III responses to the societal value question;
b. The events with the most negative value for society;

c. The events with the highest convergence between groups with reference to its date of occurrence;
d. The events with the least convergence.

The coordinators felt this mix would provide the widest range of events for this prototype study. Also, due to the extremely critical time limits available for analyzing data and selecting events, these criteria would allow computer selection. For specific planning purposes, it may be that a panel of judges would further select events, based upon specific planning needs. This particular study was, however, not a data-gathering exercise, but a design prototype. Thus, it must be stressed that the data, while potentially interesting, were collected only to refine a process, not for planning purposes.

In this last round, respondents were asked to provide two pieces of information:

a. Their perceptions as to which of the four groups had the power to enhance or inhibit the occurrence of each of the twenty events;
b. What strategy the respondent would pursue--as a member of his own group--to either enhance or inhibit the occurrence of each event, depending, of course, on his perception of its value to himself and to society in general.

The "power group" information was fed into the computer to be aggregated and analyzed in various ways (which group was seen as having power, group self-perceptions, self-perceptions vs. perceptions of others, etc.).

Computer Analysis of Focus Delphi*

The reason for using the computer should be made clear. Enormous amounts of data processing are required to obtain maximum benefit of looking at the differences between groups. While the predictive nature of these differences are of dubious value, the differences should be examined for heuristic purposes. A long-range study is clearly called for by which the analyses of data are tied to real world events. Such correlation-like studies could give the policy-maker valuable guidelines concerning how differences between groups affect the lives of man.

Background of Analysis

All computations for Rounds II and III of the Focus Delphi study were done on an IBM 360/50 computer, through a 2741 typewriter terminal, using APL. There was a slight storage problem since an APL workspace has only 32,000 bits of storage; 4 such workspaces were used to store all data and programs.

Whenever possible, fixed point arithmetic and storage were used. Total CPU time for both rounds, including writing and debugging of programs, was 30 minutes, which is not unusual for APL, a relatively slow interpretative language. The program is available from the Educational Policy Research Center at Syracuse.

There were 65 respondents to the Round II and Round III questionnaires, answering questions for 63 events. For Round II, "most probable date" was the only statistic worked with, while for Round III there were three statistics gathered and compared: changes in the most probable date,

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* Special credit must be given to Mr. Michael Folk for his design of the computer program for this study.

"value to you," and "value to society." In Round IV, the only information entered were the various perceptions of power to enhance or inhibit the occurrence of specific events. All were entered at the APL terminal.

Statistical Considerations

Round II. The Round II statistic used was "most probable" date of occurrence of each of the 63 events. With responses like "later" and "never" acceptable, it was impossible to consider most of the usual measures of central tendency, so we chose to examine only median and inter-quartile range. Any event whose predicted date of occurrence (henceforth referred to as PDO) was 1990 or later was automatically considered as "later" unless stated as happening "never." For example, if for an event the median falls in the interval 20 to 47.5 years from now, the event can be considered as having a PDO later than 1990, but not "never"; nothing further is implied.

The median and inter-quartile range for each event was computed for each group; then the computer generated a graphic display for each event of the four different inter-quartile ranges and medians (see sample Round III questionnaire, Appendix C). No other statistical computations were done on the Round II data. It was noted that for some events, groups disagreed by as much as 15 or more years on the median PDO.

Round III. On the third round, participants were asked to observe the medians and inter-quartile ranges for each event, generated during Round II, to reconsider their original guess, and to revise it if they chose. They were asked to judge the value of each event's occurrence to themselves and to society on a ++, +, 0, -, -- scale and to write their opinions of the consequences of each event's occurrence to society. The first three types of response, which we will call "date forecast,"

"value to you," and "value to society," provided quantified data of which statistical analysis is possible.

Some Findings from Round III

Date Forecasts. Agreement among groups on median date forecast ranged from complete agreement to complete disagreement. The median interval between the earliest and latest median forecast for an event was 4.5 years. Thirteen events had all four medians in a two-year interval, nine of these were forecasted to happen by 1976.

There was some indication that there was more agreement on events with an earlier PDO, but there were exceptions to this. Only two of the forty events whose medians fell in the shortest intervals were forecast to occur later or never, while all of the twenty events whose medians fell in the longest intervals were predicted (by some group) to happen later or never.

The average of the four medians for each event indicated that 55 events would happen by 1985. The average 75th percentile indicated 39 events would happen by 1985; the 25th percentile had 60 events happening by 1985.

There was no event which everyone (even everyone within a single group) predicted would never happen. In fact, for events whose entire inter-quartile range fell in the interval "later-never," there always seemed to be several who thought they would happen within one or two years.

Changes in Date Forecast.* Respondents were asked to revise the PDO estimates which they had made in Round II. Only 2 major changes in median date forecast occurred, both by one (or "the same") group, which we note had only 8 participants and therefore is probably statistically insignificant.

In general the inter-quartile range decreased, as should be expected, but the decrease was not dramatic. The greatest shifts in median forecast occurred for events forecast within the decade. Moreover, eight of the ten greatest shifts were toward sooner occurrence of the event.

If each group is given equal weight, the overall average change in median is +.26 years**; the overall average per cent change in inter-quartile range is -1.68 years, or a decrease of 9%. Only 4 events had an increase in inter-quartile range, while 54 inter-quartile ranges decreased. The greatest growth in inter-quartile range was 5 years; the greatest decrease was about 14 years.

Value Assessments. Each person gave estimates, for each event, of the value of the occurrence of the event to society and to themselves. For computation, the value scale was 1-5, where 1 stood for -- and 5 for ++. A value assessment of 3, then, indicates neither negative nor positive value. Some findings follow.

Value to Society. Generally, events were seen as of positive value to society. Group 4 had the highest percentage (78%) of positive value

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* It should be pointed out that between Rounds II and III the nation experienced its first national student strike. The effect of this event on any change or non-change in date forecast or value assessment is not within the scope of this study, but might well have been significant.

** We suggest that the small size of group 2 would render this insignificant.

responses; group 3 had the lowest percentage (70%) (Table 10). Group 4 had 3 events on which all agreed were of ++ value. No other group had total agreement on a ++ value. In fact, group 4 seemed to exhibit most agreement.*

Five events were seen by at least three of the four groups as among the ten most valuable to society. Seven events were seen by at least three groups as among the ten least valuable. There was little evidence of a correlation between positive value and median PDO, but we suggest that more negative events are predicted to occur in the later years.

Value to You. In general, events were seen as being of positive value to the individuals. However, no group saw any event as being as valuable to themselves as it was to society. Group 3 had the highest percentage of positive responses (57%), while group 4 had the lowest percentage (49%). We note that this is the opposite of the result for value to society. Groups 2 and 4 both seemed to exhibit the most agreement.

There was little or no evidence of correlation between value to self and median PDO.

General. Group 4 seemed to see the events as of more value to society and less value to themselves than any of the other groups. Group 3 seemed to see the events as of less value to society and more value to themselves than any other group. Group 4 saw fewest events as insignificant to society and the most events as insignificant to self.

Four events were seen as of positive value to both society and self. Two events were among the ten most valuable to both society and self for

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* See Round IV questionnaire, Appendix D, for results by event and by group.

every group. Six events were considered of negative value to both society and self. All groups had the same three events as among the ten most detrimental to both society and self.

There was no strong evidence of a correlation between value and median estimated time of occurrence.

For 12 of the 20 events in Round IV there was better than 67% agreement as to which of the several groups had the power to cause its occurrence if they pursued the event as a goal.

In all 20 events (in Round IV) either group 3 (industry) or group 4 (policy-makers and advisors) were perceived of as having the power to cause them to occur.

Note: A fifth round is essential to create a useful chronology of events. The temporal data would, it is assumed, be radically reordered with the availability of the value information and the perceptions of power. While the available data could have been used to construct a bogus chronology, the information would have been so misleading as to have made such an effort a disservice.

We wish to re-emphasize that had there been more time and money many different statistics could have been computed, many different comparisons could have been made. At the least, statistical significance tests should have been run on those correlations which were remarked upon. Considerably more time and resources would be required to examine thoroughly the different approaches for a Focus Delphi study and to determine the best.

Designer Comments on
The Focus Delphi as a Planning Aid

The Assessment of Goals and Strategies against Future Events

The Focus Delphi may be useful to help planners examine their goals against the perceptions of interested publics concerning those goals and other intervening events.

Specific Areas of Attention

Events posited to occur in the future may be thought of as goals if an aggressor for their occurrence can be specified. If an event is the institution's goal, its perceived value to several groups of society can be examined by those subsets of the society and duplicated for the planners. An array of consequences for the aggregate society can also be examined.

Value to Planners

Information gathered by a Focus Delphi can be examined a number of ways:

- The perceptions of the date of the occurrence of any event can be examined against perceptions of power to cause the event. If, for example, all groups estimate an event will occur by 1975 and the same group is seen by all as having the power to affect the event's occurrence, but they do not care to aggress for the event, the event probably will not occur because the power group will not pursue it.

- The repeated strategies of each group can be examined to see the array of behaviors that the planner might be forced to confront while pursuing his strategy.

- A planner can examine his strategy through time against dated intervening events to examine where and how impacts might occur.

- Emerging future events beyond institutional control that may impact on the planner's goal can be identified.

- Events can be examined against a strategy, and a contingency plan to forestall negative impacts can be prepared.

- The consequences of an event, anticipated by the participating groups, can supply the planner with previously unforeseen outcomes to substantiate or modify his case.

- The value of any goal to individuals can be weighed against the value to society in evaluating the goal.

- An examination of strategy responses can improve understanding of the political attitudes of various groups of the society.

- To examine the amount of planned goal attainment, consequences are weighed against event dating to assess probable consequences if the date were shifted.

- In summary, then, the questions a planner might ask while examining his goals are:

  - What events have impact on the primary goal?
  - Are these events goals in themselves? Of whom?
  - When do various groups anticipate it will occur?

- Of what value is the event to each group? Individual?
- Of what value is it seen as being to society?
- Of what societal consequence?
- Who is thought to control the event?
- What can be done to help or hurt it?
- Can the events be redated to modify impacts and perception? How?*

- Where dissensus exists between participating groups, the planner can get a sense of the various opinions, related directly to the nature and/or description of the event. Can the same event be stated another way to change attitudes about it?

By systematically focusing on the questions raised here, a planner can begin to cope with the array of concerns and reasons for concern demonstrated in various sectors of society. In the prototype study, for example, it is interesting that both the high school (input) and college (throughput) groups felt they do not have very much control. Some control may need to be given them to increase their concern and interest in any given future event.

The purpose of the Focus Delphi, then, is to help planners assess their strategy options against the beliefs, attitudes, and consequences felt and seen by various members of their society to help determine the value of planned goals.

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* This is a modification of our first experiment reported here. It is in use in all our subsequent contract work with the tool.

INTERLUDE

Posit an institutional planning group whose members now understand the implications of the pursuit of their long-term goals. Now they must examine the entire array of goals to determine priorities. Goal statements are, at best, only understood as cliches. To rally support and justify pursuit of his goal, the planner must make clear to the institution the implications of the goal statement and how the goal impacts and is impacted upon by the pursuit of all other goals.

We must examine the impact of these goals. Certain goals will be at cross purposes with each other. We examine these cross purposes with the aid of the Cross-Purpose Matrix.

PART II

THE CROSS-IMPACT/CROSS-PURPOSE MATRIX; A TOOL TO HELP SET INSTITUTIONAL PRIORITIES

THE CROSS-IMPACT/CROSS-PURPOSE MATRIX; A TOOL TO HELP SET INSTITUTIONAL PRIORITIES

The Cross-Impact Matrix

The Cross-Impact Matrix is a computer program designed to rectify a major flaw in Delphi (discussed earlier). The flaw had been recognized by the designers of Delphi and the fact is that events in a Delphi are dealt with as independent entities. No notice is given in Delphi to the possibility that the occurrence of one event will alter the probability of the occurrence of a subsequent event. Of all the issues facing forecasters the problem of event interdependency is probably the most vexing (Pardee in Gordon-Hayward, December 1968, p. 101). It is hard to think of an event for which no predecessor exists in some causal manner (Pardee, p. 101).

A general theory of cross impacts does not exist (Gordon-Hayward, December 1968, p. 101). The Cross-Impact Matrix program attempts to deal with this problem. The process is rather simple. Events drawn from a Delphi are examined against an arbitrary time horizon to assess their probability, plausibility, and impact. An additional problem is caused by the different nature of various "future events," as discussed in the previous section. Both the Cross-Impact Matrix and Cross-Purpose Matrix deal with future events. The Cross-Impact Matrix deals with that subset of future events called "future news events." The Cross-Purpose Matrix deals with that subset of future events called "goals."

However, a continuing problem not yet effectively dealt with is the substantive nature of the judgments required when filling in the cells of the matrix. There is ample evidence that the quality of output from a Cross-Impact Matrix is very much determined by the quality of analysis and judgment which goes into filling the cells (Ziegler, May 1970, p. 99). Further, Michael Folk, working on the mathematic formula used in the device, finds serious and apparently unresolvable problems with claims made for the device (Folk, 1971). These dissatisfactions led to the design of what is called the Cross-Purpose Matrix.

The Cross-Purpose Matrix

The Cross-Purpose Matrix was devised to deal with goals pursued by advocates within an institution. A goal is an event that is intended by someone to occur. The Cross-Purpose Matrix attempts not to replace the Cross-Impact Matrix, but to deal with a subset of future events, i.e., goals, that cannot be assessed in the same way as future news events. The first application of the Cross-Purpose Matrix was in the MIDSIM exercise.*

The Cross-Purpose Matrix has several operational rules: 1) There is an identified aggressor, i.e., advocate, for each goal. 2) Original probability information concerning the impact of other goals on his--and vice versa--as reported in each of the matrix boxes can be determined only by the person aggressing for the goal under consideration. 3) The full meaning of a goal, its impact on each of the others, and the impact

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* The Maxwell International Development Seminar was a 30-day re-orientation program for staff officials of the Agency for International Development of the U. S. State Department on overseas assignments in several areas of concern. The Educational Policy Research Center at Syracuse contracted to construct a planning exercise (MIDSIM) to help focus participants' attention on long-term planning.

of each of the other goals on it depends upon how the aggressor intends to behave in pursuit of his goal. This strategy, since it has not yet been specified, is known only to him. Thus, the subject of discussion between advocates is their planned strategies. The examination of the goals themselves is inadequate. The very process of grouping under a single goal all possible ways one might behave in order to reach that goal tends to hide the way one will behave. Unintended consequences and strategies which negatively affect other goals are thus often unexplored. What must be explicated and assessed are the activities and events that comprise a sufficient strategy to bring about the goal's attainment. These basic conditional rules underlie the Cross-Purpose Matrix.

To prepare his goal for consideration the planner must answer several questions:

1. "If the institution adopted my goal as its top priority, when is the earliest possible date it could occur, knowing the time necessary for each of the activities and events that comprise my proposed strategy which is sufficient to force the goal's occurrence?"

2. "I know competing goals exist within the organization, all vying for limited energies. I know them only as cliches, but some are probably as worthy as mine. Knowing this, and nothing more about the other goals, when is it most plausible to assume my goal will become an occurred event?"

A matrix is constructed with all goal statements under examination listed both vertically and horizontally at the side and top of the matrix (see Figure I, Appendix E, page 71). Events are listed chronologically from top to bottom and left to right, based on the most plausible estimate of the occurrence date (question 2) set by the goal advocate.

Advocates for each goal complete a portion of each row and column appropriate to their goal. The process is as follows: When answering horizontally across the matrix (row), each responds by asking himself for his goal with respect to each other goal this question: "I assume I am going to be 100% successful in attaining my goal. If so, what will the effect of my success be on the hoped-for success of each of the other goals as I understand them?" Responses are marked in the bottom half of each square in the appropriate row in the matrix. The designation of impact is ++, +, 0, -, --.

The same goals are approached by each individual vertically (column) on the matrix, and responded to in the top half of each box; to respond he asks himself this question: "I assume their goal is 100% successful. What will its success do to me and my hoped-for success?" He again responds with a ++, +, 0, -, -- scale (see Figure I, Appendix E, in which hypothetical goal #4 has the appropriate halves of each cell marked).

Individual responses are then displayed on one common matrix, all goal advocates' responses being visible to all others. The focusing material necessary for goal assessment through strategy specification is now displayed. The positive and negative impacts of the various goals, as seen by all the individual goal advocates, is visible. This display demonstrates the various perceptions of each goal and how they are affected by others' goals. This exercise compels planners not to consider their goal as given.

In any box in the matrix, a spread of opinion is displayed (see Figure II, Appendix E, page 72). The bottom half of any box along the horizontal (row) shows the goal advocate's view of the impact of his program's success on the hoped-for success of the goal listed in the vertical. The top half of the box shows the same information, but from the perceptions of the goal advocate of the vertically (column) listed goal.

That is, assume a horizontally listed goal, "a," and a vertically listed goal, "b." Their advocates are indicated by A and B respectively. In the bottom half of the box, A indicates his view of the effect upon "b" of the total success of "a," while in the top half is B's perception of the goal "a" upon "b"--both ask the same question, but the answers come from two different perspectives. Each box, of course, has its alternate, where the reverse question (the effect of "b" upon the total success of "a") is asked by each participant. Though the information spread can be analyzed, this exercise is best used only to move the planning group forward to a more important stage of the exercise.

Individuals or groups now attempt to discover the reasons for the spread of opinion in any given box. They do this by discussing the full meaning of the goal, its implications, and the strategy the advocate sees as sufficient to attain the goal, i.e., "what does this cliche mean?" "how do you propose to pursue your goal?" The process continues until each cubicle of the matrix displays only one bit of information. That bit of information is the agreed-to perceptions of both goal agressors as to the probable impact (-,0, or +) of one goal on the other.

We might now add to this matrix of goals various "news events" that comprise one possible future environment over time. Thus, the participant is asked to respond not only about his goal with respect to all other goals, but with respect to news events beyond direct institutional control:

- "If my program is successful, what is its impact on the occurrence of the news event?"

- "If the news event occurs, what does it do to the anticipated success of my goal?"

Analysis

At this stage it is appropriate to ask questions about the information displayed. The responses represented in the matrix by + and - symbols give an array of perceptions about the impact of the pursuit of each of a set of goals on all other goals of that institution.

First, in any cubicle of the pre-negotiation matrix (where a spread of opinion may still exist) some cubicles may have a common impact sign (+/+). However, that does not mean there is common perception of the impact. The same discussion concerning goal implications and strategy must take place:

- Perceptions of participants may have been based on a misunderstanding of the goal;
- The goal may have been too abstractly described to accurately reflect expected changed behaviors foreseen by its advocate;
- The idea may have been too novel to be understood without its advocate's rationale and the value shifts it implies;
- The goal may be agreed to, but the sufficient strategy may alter perceived impacts.

Further, the dynamics of the negotiation process itself can be examined:

- What is the nature of the negotiations? That is, "Who moves?" "Who seeks whom?"
- What is the direction of agreement when they finally arrive at an impact? Is it toward the affected or the affector?

- Why did agreement occur (if it did)?
- Was change based on rational or other grounds?

Any institution contains sectors of interest and of different subject concerns. One can examine all the goals in a single sector of interest against the others. This helps specify, within any individual sector of interest, a top priority program within that sector. One might also examine the programs of one sector against the programs of one other sector, examining whether the sectors interact or if any programs within them affect each other, i.e., the goals of the research departments vs. those of the engineering department.

One can examine the highly negative cells and the highly positive cells--that is, those with a -- or ++, both before and after negotiation. What is the nature of the high impact perceived by both parties? One might also analyze the spread, which may be quantified on an absolute scale. The spread between ++ and -- in any box is a relative misunderstanding of 4; that is, there is a spread of five digits between those two. The difference between + and 0 is an absolute spread of 1. Absolute spreads can be quantified to examine the magnitude of misunderstanding between certain sectors. That is, does the terminology and value of a sector tend to be regularly misunderstood by any other sector?

Next, one might examine the general range of impact of each goal:

- What are the goals that consistently have no perceived impact on any others?
- Which goals and their strategies tend to be stable, that is, unaffected by those external news events mentioned above?
- Which tend to be unaffected over-all by the occurrence of many news events or the occurrence of all other programs?

Those that are apparently unaffected by events we might call stable goals. An unstable program would be perceived by the participants as very sensitive to the occurrence of other events.

We might examine at what moment a goal is unstable and at what moment in time it becomes stable. For example, a new government agency languishes on an unstable state where nearly any news event affects it until it receives its funding. From that moment until the next funding request, it is largely a stable agency. It would be perceived as such and would be visible in the matrix as such. This kind of analysis allows the executive to calendar those things he feels are fragile at various moments, rather than to worry about everything all the time. Another examination one might make is to focus concern on those programs within the matrix which show consistent value for all other programs, positive or negative, at the moment when they are planned to occur.

These comments, then, explore some possible uses of the Cross-Purpose Matrix as an interaction device for long-range planning. The Cross-Purpose Matrix represents a confrontation focusing device, which compels planners to array their strategies before competing advocates and to defend them. The strategies reflect planned behaviors over time. The interactions of these behaviors with the outside world build a material base for the set of events that occur and affect all lives in a society. The exercises described above present a logical set of questions that long-term planners might reasonably confront in preparing to alter the future.

The future environments we will actually encounter will include the results of the actions of present men, pursuing what they believe to be worthwhile goals. Men can thus carefully examine future plans in a future environment (one that is comprised of a set of events they agree are plausible). Men believe in what they do. In the planning stage they must

seize the opportunity to suspend their disbelief and to examine their ideas in dispassionate terms of sufficiency.

* * *

AUTHOR'S NOTE

Throughout this report the underlying assumption has been that we must see the future as filled with an array of human goals. To study and examine a future, an individual most consider his examination as merely sufficient. When priorities are specified and goals pursued, any sufficient future becomes linked to the present. Men must examine their sufficient plans before these plans are imposed on an unprepared world.

When futurists and policy-makers use techniques that induce consensus, or conformity to an opinion, each individual's ability to believe is threatened. Those who disagree with the consensus find the foundation of all their thoughts about the future weak and undermined. Consensus attempts to induce closure. Too early closure prevents suspended disbelief and compels us to operate as if what we do were necessary rather than merely sufficient, inevitable rather than a matter of choice.

Only sustained divergence allows a more thorough examination of plans to exist, yet divergence becomes more difficult to sustain as our play at futures grows formalized. Convergence and consensus methods reach closure but eliminate alternative future possibilities.

BIBLIOGRAPHY

Dalkey, N. C. Delphi. Santa Monica, Calif.: RAND Corporation, Report P-3704, October 1967.

Folk, Michael. A Critical Look at the Cross Impact Matrix (RR-7). Syracuse, New York: Educational Policy Research Center, August 1971.

Gordon, T. J. and R. H. Ament. Forecasts of Some Technological and Scientific Developments and Their Societal Consequences. Middletown, Conn.: Institute for the Future Report R-6, September 1969.

_____ and H. Hayward. "Initial Experiments with the Cross-Impact Matrix Method of Forecasting." Reprinted from Futures, I, 2 (December 1968), pp. 110-116.

Helmer, Olaf. A Use of Simulation for the Study of Future Values. Santa Monica, Calif.: RAND Corporation Report P-3443, September 1966.

_____. Social Technology. New York: Basic Books, 1966.

_____. The Use of the Delphi Technique in Problems of Educational Innovations. Santa Monica, Calif.: RAND Corporation Report P-3449. December 1966.

_____ and N. Rescher. "On the Epistemology of the Inexact Sciences." Reprinted in Management Science, VI, 1 (October 1959), pp. 29-52.

_____, et. al. Development of Long-Range Forecasting Methods for Connecticut: A Summary. Middletown, Conn.: Institute for the Future Report R-5, September 1969.

Pardee, F. S. In T. J. Gordon and H. Hayward, "Initial Experiments with the Cross-Impact Matrix Method of Forecasting." Reprinted from Futures, I, 2, December 1968, pp. 110-116.

Sandow, Stuart A. MIDSIM. A Simulation Exercise in Three Phases. Syracuse, New York: Educational Policy Research Center, October 1968.

_____. "The Pedagogical Structure of Methods for Thinking About the Future." Working Draft. Syracuse, New York: Educational Policy Research Center, September 1970.

_____. "The Pedagogy of Planning: Defining Sufficient Futures." Futures, III, 4 (December 1971).

Toffler, Alvin. "Value Impact Forecaster--A Profession of the Future." In K. Baier and N. Rescher (eds.), Values and the Future. New York: The Free Press, 1965.

Weaver, W. Timothy. Delphi: A Critical Review. RR-7. Syracuse, New York: Educational Policy Research Center, February 1972.

Wolfson, Robert J. and Manfred Stanley. "Beyond the Invisible Hand: Policy Advisors and Their Clients." Working Draft. Syracuse, New York: Educational Policy Research Center, January 1970.

Ziegler, W. L. An Approach to the Futures Perspective in American Educational Planning (RR-1). Syracuse, New York: Educational Policy Research Center, May 1970.

APPENDIX A

FOCUS DELPHI

ROUND I MATERIALS

FOCUS DELPHI--ROUND I QUESTIONNAIRE

In the spaces provided below, list ten events that you conjecture might take place during the next fifteen years that you perceive may have some impact upon electro-mechanical technology and education. In your conjectures, think about things that might happen that would affect:

- administration of schools
- industrial training programs
- manpower needs of the industry (in terms of number and capacity)
- instructional methods, i.e., how could what is taught be taught more effectively
- curriculum, i.e., what is not taught now that will have to be sometime during the next fifteen years
- industry hiring practices
- practices concerning admission to educational or training programs
- technical advances that will seriously affect both industry and their educational inputs
- nature of student population (racial, sexual ratios, etc.)

Events might be:

- new legislation
- policy decisions
- occurrences
- technical breakthroughs
- major shifts of opinion and attitudes in various populations (students, personnel in charge of hiring, teachers, administrators, the general public)
- changes in curriculum or instructional methods in the schools

Do not feel constrained to placing dates on the events, or placing the in any chronological order. Simply list ten events that you conjecture as being plausible during the next fifteen years.

FOCUS DELPHI--ROUND I RESPONSE FORM

Event 1 _____

_____

Event 2 _____

_____

Event 3 _____

_____

Event 4 _____

_____

Event 5 _____

_____

Event 6 _____

_____

Event 7 _____

_____

Event 8 _____

_____

Event 9 _____

_____

Event 10 _____

_____

Name _____

(Please print)

APPENDIX B

FOCUS DELPHI

ROUND II MATERIALS

Dear

Thank you for your prompt response on the first round of the Focus Delphi. The events in this second round are drawn from your lists of conjectured events.

All of the events on this questionnaire were generated by panelists. We have taken events that occurred repeatedly on the questionnaires, that seemed particularly interesting, or could have high impact for educational planning. These events were then grouped into three categories--Educational, Industrial, and Technological Breakthroughs--and rewritten. The rewording of some of the events was necessary to allow them to be read with as little misinterpretation as possible, and to remove from them as much "value weighting" as possible.

The purpose of this round is to assign dates to the events. You are asked to conjecture about two dates: Most Probable date of occurrence (MP) and Earliest date of occurrence (E).

In other words, speculate as to when you think the event listed will Most Probably have already occurred. It might be helpful to think of this in terms of percentages, so think of it as "By what date will there be a 90% chance that the event will have already occurred?"

Likewise, conjecture about the Earliest probable date by which you think each event can occur.

Place these dates in the appropriate columns next to each event, being careful to place the Most Probable date in the column "MP" and the Earliest date in the column "E".

Then, in the spaces marked for the time continuum, place a dot approximately under the date you have chosen as the Most Probable. You will notice that as the time indicated is further into the future, the amount of space allotted for each year decreases. This is because it has been found through a number of studies that the further people conjecture into the future, the less precise their conjectures become. Thus, it is not necessary to be as precise in the placement of the mark for the years 1981-1985, as it might be for 1973-1976.

You will also notice that columns have been marked "Later" and "Never." If you think that the event will occur AFTER 1985, but that it will occur, place a mark in the "Later" column, and place an "L" in the "MP." This, of course, does not mean that it might not occur before 1985, so you can place a date in the "E" column.

If you think the event will never occur, for any reason, place a mark in the "Never" column, and place an "N" in the "MP" column.

At the end of the list of events, one page has been left blank in case you would like to add additional events to the list. Write your events in the appropriate place, fill out the other columns as instructed above, and return the questionnaire. If a number of people add the same or similar events, these events will be included in subsequent rounds.

Please return the questionnaire in the enclosed envelop within two days after receiving it. We very much appreciate your prompt response and will return the next round as soon as possible.

Thank you.

DeLayne Hudspeth

DH:cm

Enc.

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FOCUS DELPHI - ROUND II RESPONSE FORM

EDUCATION EVENT	MP	E	1970-1972	1973-1976	1977-1985		
1. Government subsidies to institutional programs of electro-mechanical education increase 50% over 1968 levels due to skilled manpower shortage.							
2. Federal legislation requires administration to deal much more authoritively with disruptors of classrooms. Minimum punishment: one semester suspension.							
3. White students rejected from programs with rapidly growing black student population (yearly increase 50% or more) take legal action against schools and programs to show cause.							
4. Female enrollment in previously predominant male technical programs double 1968 level.							
5. Programs that allow students to leave and re-enter educational programs without penalty instituted at many schools and recognized by industry. Many students work at the sympathetic industries between school stints with no work or pay penalties.							
6. Federal government allots six million dollars a year to plan, develop, and encourage innovational occupational programs of education.							
7. Technical and vocational courses removed from academic centers and concentrated into area centers with close contacts with local and large industry.							
8. Soaring college costs cause three fold increase in vocational program enrollments.							
9. Engineering colleges will demand that high schools take over full instruction in calculus, computer programming, and industrial graphics.							

APPENDIX C

FOCUS DELPHI

ROUND III MATERIALS

Dear Respondent:

Enclosed you will find Round III of the Focus Delphi Study. Although at first glance it may seem formidable, it should take less time than the first two passes to complete.

Explanation of the Data Display

In this pass, you will find displayed the data you ventured to us on the last questionnaire. The inter-quartile range of the data (the middle 50% of the range of dates) is displayed with dash lines. For example, for event #3, group #1, the interquartile range of dates is from 1971 to 1981.

1970 75 80 85 90 Later Never

For group #2 in event 3, the range is from 1976 through N (never).

The median date (the date above which one-half of the respondents conjectured) is indicated with an arrowhead. Again, using event #3, group #1, we find that 50% of the respondents gave us dates above 1974, and 50% responded below 1974.

1970 75 80 85 90 Later Never

As you can see, the range of responses varies widely--sometimes by "group," and sometimes widely within a single group.

Groups

The total population involved in this study can be broken into four groups:

Group 1: Teachers, counselors, and administrators of New York State high schools.

Group 2: Teachers and administrators of two-year vocational schools with programs in electro-mechanical technology.

Group 3: Employers of graduates of electro-mechanical programs and recent graduates of such programs currently employed.

Group 4: Personnel at various levels of the New York State Department of Education and Vocational Training and others affecting educational policy.

Written on the upper left hand corner of the questionnaire you will find your name with a number (1-4). This number indicates the group in which you are placed, even though some participants could fit into more than one of the categories described above.

Task

We are adking you to do three things on this pass: (1) examine the relationship of the date you provided us with the range of dates from the four groups; (2) assign a value estimate to the event: and (3) write a very short description about the possible consequence of the event in question.

1. Your original date estimate is in the "MP" (most probable) column. Compare your date to the interquartile range of your group and the other groups as defined above. If, upon reconsideration, you would like to change your estimate, put the new date in the "New Date" column located to the right of the "MP" column, and explain briefly the reasons for the change in the "Consequences for Society" column. ("L" would be used for later than 1990 and "N" for never). If you feel your original estimate was best, then put a check mark in the "New Date" column.

2. After looking at the date of each event, go to the column marked "Value to You." In this column please respond to the following question: "Assuming that the event in question WILL OCCUR, what will be its effect on me personally?" Use one of the following symbols:

++	High positive value
+	Positive value
0	Little effect, if any
-	Negative value (it will hurt me, but not much)
--	Extreme negative value

For instance, if an event were to occur that would substantially raise your standard of living, however you personally define that, it would be a ++ event; if however, the occurrence of the event would mean that you would lose your job and would make you unemployable, it would be a -- event.

3. Next, and irrespective of how the event would affect you personally, think about the consequence of this event upon society as a whole. Assign the same value sign of ++ (high value) to -- (negative value), put this symbol into the "Consequences for Society" box and then write a terse statement describing the nature of this consequence. (E.g., it would improve the quality of education; or, it would contribute to pollution).

Many thanks for your patience. The next and final round will have fewer items and be much less complex. Please take the time to complete this within the next two days. Your honorarium will be mailed within two days after the final questionnaire is retuned.

Sincerely,

DeLayne Hudspeth

DH:cm

Enc.

EVENT	MP	New Date	1970 / 1975 / 1980 / 1985 / 1990 / L / M		Value to you	Consequences for Society
10. Rapid technological progress will demand increased curriculum change (i.e., 50% new curriculum every two years).			1 2 3 4	10		
11. Financing of public education no longer dependent on real estate, and availability of funds no longer dependent on local vote.			1 2 3 4	11		
12. All mechanical vocational programs demand knowledge in electronics.			1 2 3 4	12		
13. High school vocational guidance programs are based largely on extensive use of programmed and computerized national diagnostic and prognostic tests.			1 2 3 4	13		
14. Industry increases grants to schools and technical programs and reduces its internal training programs.			1 2 3 4	14		
15. Federal and state governments limit financial support for liberal arts education to spend more on national manpower needs.			1 2 3 4	15		
16. Physiology curriculum introduced in technical program areas that prepare students for jobs in medical technology.			1 2 3 4	16		
17. More curricular emphasis on practical rather than theoretical engineering, except in engineering graduate schools, i.e., most technical schools offer a maximum of two courses in theory, neither of which is required.			1 2 3 4	17		
18. Technical and vocational schools hire industrial consultants to serve on curriculum committees.			1 2 3 4	18		
19. Complete federalization of those training programs that serve industry with colleges, universities, and vocational schools collecting tuition costs from government rather than students.			1 2 3 4	19		

APPENDIX D

FOCUS DELPHI

ROUND IV MATERIALS

Dear Respondent:

Attached to this letter are twenty events which constitute the fourth and final round of the Focus Delphi. The data displayed on these events were provided by you on the last round. We are asking you to provide two additional judgments about each event.

First, let me review the format of the questionnaire. The numbers on the time line for each event refer to four subgroups:

1. Teachers and administrators of high schools involved in technical education.

2. Teachers and administrators of technical programs in two-year programs of electro-mechanical education beyond the secondary level.

3. Employers of recent graduates of programs of electro-mechanical education and recent graduates of such programs.

4. Policy advisory persons to the New York State Department of Education concerned with technical education.

Time estimates from each group are represented with ---- lines. The length of the line indicates the middle 50% of responses (the top 25% and bottom 25% were dropped). The V symbol indicates the median; that point above wich 50% of the participants placed a date.

In the next two columns to the right, "Personal Value" and "Value to Society," the percentage numbers represent responses to the two questions: "What value do you see the occurrence of the event having for you personally?" and "What value do you see the occurrence of the event having for society in general?" As you can see, these responses have been reported back by groups, as defined above.

The next column reports back, collated and edited, specific consequences for society assuming the event occurs. These have been marked as to whether the respondents thought that the consequence was positive (+) or negative (-). In all cases, the positive consequences are listed first, the negative second. By reading this information in conjunction with the percentage figures in the two columns given to "values," you can assess the information.

For example, for Event X, Group 1 and Group 2 list their value responses as follows:

	Personal Value			Value to Society		
	-	0	+	-	0	+
1	10	40	50		20	80
2		35	65	10	80	10

This means that 10% of Group 1 saw negative personal value assuming the occurrence of the event, 40% saw no impact at all, and 50% saw the occurrence of the event as positive for themselves. At the same time, none in the group saw any negative impact on society, 20% saw it as having no impact on society, and 80% saw it as a socially valuable event. In Group 2, the responses were different. The "Consequences for Society" column gives specific reasons for the responses in the "Value to Society" column.

The next two columns, those with an asterisk (*) above them are blank and to be filled in by you.

Column labelled "P of P": The letters stand for your "Perception of Power". Assuming that the event <u>can be made to</u> or <u>prevented from</u> occurring, you are to conjecture "Who among the four groups as defined above do you think would have the power to cause its occurrence?" When you have decided which group this would be, place the number of the group in the space provided.

Column labelled "Strategy (Enhance or Retard)": In the space provided, and as briefly and succinctly as possible, write <u>what you would do to enhance or retard</u> the occurrence of the event. When writing, consider three things:

a. The event's value to you;

b. The event's value to society (as you see it); and

c. Your perception of who has the power ("P of P") to enhance or retard the occurrence of the event (and how they see its value to society).

If, for example, an event would be of negative value for you personally, and you see it as being negative for society (but the group you consider to have the power to cause it sees it as positive) what strategy might you as a member of your group use to retard the occurrence of the event?

When you have completed these two tasks, return the questionnaire in the enclosed envelop. Again, please return it within 48 hours. As soon as we receive your questionnaire we will process and mail your check.

Thank you <u>very</u> much for participating. We think we have an exciting study and will send you a copy of the final report as soon as the last data is analyzed and the report printed.

Sincerely.

61

DeLayne Hudspeth

DH:cm
Enc.

EVENT	INTERQUARTILE RANGE (1970 · 1975 · 1980 · 1985 · 1990 · L · N)		PERSONAL VALUE (%) -	0	+	VALUE TO SOCIETY (%)	0	+	CONSEQUENCES TO SOCIETY	P of P	STRATEGY (Enhance or Retard)
Nine students rejected from programs with rapidly growing black student population (yearly increase 50% or more) take legal action against schools and program to show cause.	1 ---Δ---		20	60	20	32	11	58	+ Racial proportions are stabilized. Legal issues force state to greater political control. Increase in teachers' pay.		
	2 ---Δ---		27	64	9	64	18	18	- Increased racial polarization.		
	3 ---Δ---		30	55	15	45	25	30			
	4 ---Δ---		17	50	33	17	17	67			
	[13]										
All electric, automated automobile with highway guidance units available economically in Northeast and Southern California.	1 ---Δ---		5	30	65	5	5	90	+ Reduce air pollution. Conserve petroleum resources. Create jobs, reduce accidents.		
	2 ---Δ---			40	60		9	91	- Increase crowdedness of regions.		
	3 ---Δ---		5	10	85	5	5	90	Aggravate transit problem, cost of transportation.		
	4 ---Δ---		17	17	67	17		83			
	[14]										
Rapid mass transportation feasible--elimination of 75% of private urban transportation.	1 ---Δ---		5	30	65		5	95	+ Reduce air pollution. Solidify society through increased communications. Reduce cost of living.		
	2 ---Δ---		20	30	50		9	91			
	3 ---Δ---		15	10	75	10	5	85	- Only temporary relief--waste of money. Increase population spread into wilderness areas.		
	4 ---Δ---			17	83			100			
	[15]										

APPENDIX E

CROSS-PURPOSE MATRIX

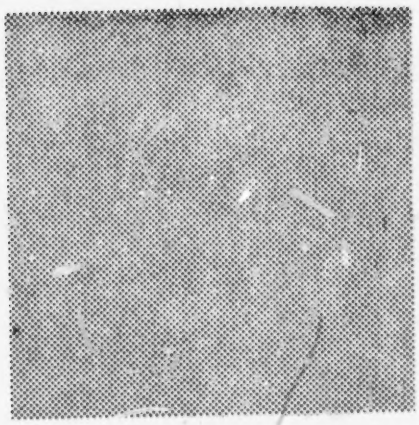
FIGURE I
FIGURE II

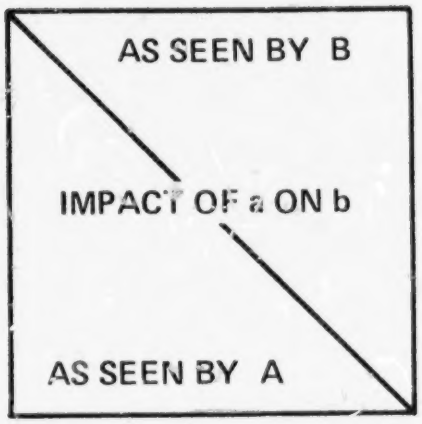
SOME OPTIONS for FEDERAL POLICY in POST SECONDARY EDUCATION - DECADE of the 70's

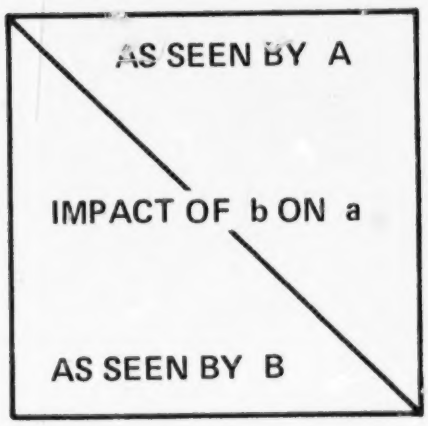
PENDING POLICIES

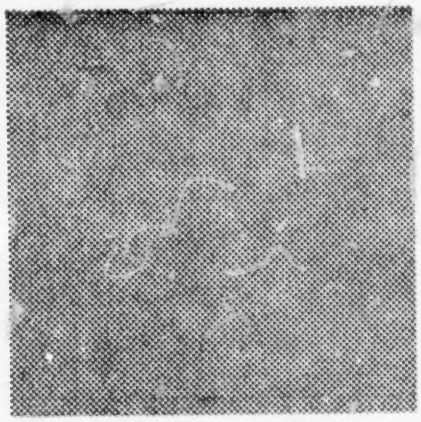
ADOPTED POLICIES		1 FEDERAL SUBSIDY DIRECT TO STUDENTS FOR ANY POST-SECONDARY EDUCATION	2 FEDERAL SUPPORT DIRECT TO INSTITUTIONS FOR ANY POST-SECONDARY EDUCATION	3 FEDERAL FUNDING OF SIGNIFICANTLY DIFFERENT CURRICULA: MEDITATION, COMMUNAL LIVING, NON VIOLENT BEHAVIOR	4 FEDERAL AID TO COLLEGES & UNIVERSITIES CONTINGENT ON THEIR USE OF RANDOM ADMISSION PROCEDURES	5 FEDERAL GUARANTEE OF 15 YEARS OF EDUCATION OVER LIFE SPAN, NO REGARD TO SEQUENCE	6 NO JOB DISCRIMINATION BASED ON CREDENTIAL OR DEGREE	7 FEDERAL SUBSIDY FOR ALL JOB RELATED TRAINING	RESOURCE / STAFF
FEDERAL SUBSIDY DIRECT TO STUDENTS FOR ANY POST-SECONDARY EDUCATION	1				− −−				ZIEGLER
FEDERAL SUPPORT DIRECT TO INSTITUTIONS FOR ANY POST-SECONDARY EDUCATION	2				− −−				BYRNES
FEDERAL FUNDING OF SIGNIFICANTLY DIFFERENT CURRICULA: MEDITATION, COMMUNAL LIVING, NON-VIOLENT BEHAVIOR	3				+ 0				TUSSING
FEDERAL AID TO COLLEGES & UNIVERSITIES CONTINGENT ON THEIR USE OF RANDOM ADMISSION PROCEDURES	4	− +	−− +	0 0		++ ++	0 ++	− ++	DEWITT
FEDERAL GUARANTEE OF 15 YEARS OF EDUCATION OVER LIFE SPAN, NO REGARD TO SEQUENCE	5				−− +				GREEN
NO JOB DISCRIMINATION BASED ON CREDENTIAL OR DEGREE	6				0 0				MARIEN
FEDERAL SUBSIDY FOR ALL JOB RELATED TRAINING	7				0 −−				MOSES

A16518-U









CROSS - PURPOSE MATRIX KEY

++ = STRONG POSITIVE IMPACT
+ = POSITIVE IMPACT
0 = NEUTRAL OR NO IMPACT
− = NEGATIVE IMPACT
−− = STRONG NEGATIVE IMPACT